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Smith's experiments with *Neocosmospora* employed soil which was uninfected by that fungus, but apparently was not sterilized, and he states that *Thielavia basicola* was present in some of the experiments. To this fact I am inclined to refer the apparent active parasitism which he found. At any rate, the form which I have isolated from the ginseng plant has not shown active parasitism.

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March 15, 1906.

EFFECTS OF AN UNBALANCED RATION.

IN 1904 an obscure disease affected the fruit of certain trees in the orchard of the Maine Agricultural Experiment Station. No similar trouble had previously come under the notice of the writer, and this note is made simply as a matter of record. A careful study of the cause of the condition described is being carried on at the present time.

In August, when about the size of walnuts, the fruits began to crack and drop. Marked indentations, somewhat similar to those made by curculio, were abundant. No evidence of insect work could be discovered, however. When the fruit was opened the tissue under the indented parts was found to be dry and brown. Most of the fruits ceased to grow, and by the first of September the larger part of it was on the ground; though early in the season all of the trees were loaded. The leaves, however, appeared perfectly healthy.

At the time of harvesting, October 10, most of the trees had lost all of their fruit. Such as remained on some of the trees was usually small and deformed; some was of medium size with one side cracked; and a small portion was without blemish. In all cases, however, the texture of the fruit was soft and spongy—about as might be expected in April or May. The surface of the fruit was also characteristic; there being numerous minute elevated 'pimples,' corresponding to the grayish dots on the fruit. This feature was so noticeable that the workmen spoke of it in handling the fruit after removal to the cellar.

Though a small portion of the fruit was

on the tree at harvest time, it dropped so easily that no attempt was made to save it for packing. The slightest jarring of the limbs would cause it to fall.

The reason for the condition above indicated is, as already noted, very obscure. A careful microscopic examination was made without finding evidence of any fungous enemy, even in the brown dry tissue above mentioned. It was then observed that the condition existed only with certain trees included in a fertilizer experiment, in which an excess of available nitrogen is applied every year. The first tree noticed was on the plat receiving nitrate of soda and acid phosphate. Later it was found that every tree on the plat, as also on the adjoining plat which received nitrate only, was affected as described. In one or two instances check trees, which adjoined the nitrate plat, showed a tendency in this direction. None of the other trees in the whole orchard, however, gave the slightest indication of the trouble. The trees on a plat given muriate of potash and acid phosphate, and on another given muriate only, separated from the first by but a single row of trees, were perfectly normal.

The supposition was made, therefore, that the trouble was physiological and due to the excessive amount of available nitrogen and the lack of potash. Of course this is a matter of conjecture and can be settled only by definite and careful experiment.

The outcome of a further study of this problem may be of interest and importance in connection with the rational fertilization of orchards.

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NOTES ON ORGANIC CHEMISTRY.

THE ACTION OF OZONE ON ORGANIC COMPOUNDS.

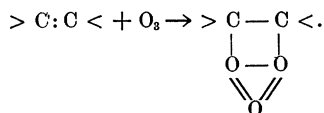
SINCE the discovery of ozone by Schoenbein, in 1840, many chemists have examined its action on organic compounds, but, hitherto, with very limited success. When a reaction did take place it resulted, almost always, in the formation of carbon dioxide and water, or in the production of highly explosive sub-

stances which were not suitable for investigation.

Some time ago Professor C. Harries, in the course of an investigation of caoutchouc, studied its behavior towards ozone. The results were not very conclusive, but they led him to take up the wider question of the interaction of ozone with organic compounds in general. He has published various brief papers on the subject, from time to time, during the interval and quite recently he has collected his results into a longer article¹ which is of considerable interest.

The first requisite was the provision of an adequate supply of ozone, of relatively high concentration, and for this purpose a special form of generator was devised by Siemens and Halske. The experiments were conducted as follows: The substance under investigation is dissolved in chloroform, or low boiling ligroin, the solution cooled in a freezing mixture and ozonized oxygen passed into it. To minimize the danger of explosion a current of carbon dioxide is directed through the apparatus, which must be thoroughly well dried; moisture in the materials must also be rigorously excluded.

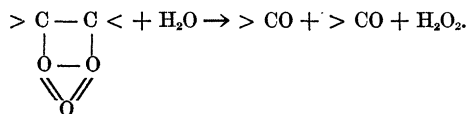
The experimental results lead to the conclusion that all organic compounds containing an ethylene linkage (double bond) add one molecule of ozone, giving rise to a new class of substances termed ozonides:



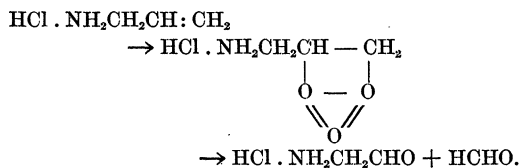
It will be observed that Harries formulates the oxygen as tetravalent; he is, however, not wholly consistent on this point in his paper and, in any case, the results can be just as accurately expressed by the bivalent formula. The ozonides are viscid oils, or colorless, vitreous syrups, more or less explosive and possessing an unpleasant, suffocating smell; some of them can be distilled under reduced pressure. They liberate iodine from potassium iodide and bleach indigo solution.

¹ *Ann. Chem. (Liebig)*, **343**, 311.

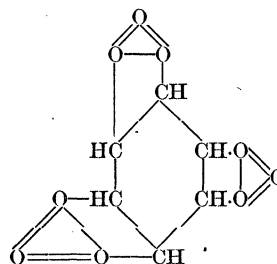
The most interesting reaction of the ozonides is with water, with which they yield hydrogen peroxide and aldehydes or ketones:



Thus, from allylamine hydrochloride, the corresponding salt of aminoacetaldehyde is obtained:

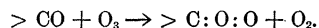


This method of work has already proved its value in permitting the comparatively easy preparation, in fairly large quantity, of many substances which were hitherto unknown, or could only be obtained with the greatest difficulty. Another, equally valuable feature of the research, is the application of the reaction to the determination of the constitution of compounds. Of many of the examples given in the original paper, one must suffice for quotation. According to Kekulé's formula benzene has three double bonds, whereas, according to the 'centric' formula it has none. If the former be correct benzene should add 3 molecules of ozone and the resulting product, when treated with water, should yield glyoxal. This is exactly what really happens, the triozone,



which is first formed, yields, with water, 3OCHCHO . This constitutes one of the strongest, purely chemical supports for the Kekulé formula which has been discovered for many years.

The action of ozone on carbonyl derivatives (aldehydes or ketones) is hardly less interesting than its behavior towards unsaturated compounds. Under similar experimental conditions to those described above, ozone causes the addition of one atom of oxygen to each carbonyl group.



These substances, which are peroxides, readily react with water forming hydrogen peroxide and regenerating the original carbonyl compound. It will be observed that the peroxides of aldehydes are isomeric with the acids which may be derived from these aldehydes; thus, heptioic aldehyde (œnanthol),



yields the peroxide, $\text{CH}_3(\text{CH}_2)_5\text{CH}:\text{O}:\text{O}$, which is isomeric with heptioic (œnanthic) acid, $\text{CH}_3(\text{CH}_2)_5\text{COOH}$. It is found that such peroxides change spontaneously, after some time, into the corresponding acids, a fact which may have an important bearing on the theory of the oxidation of aldehydes to acids.

In the case of carbonyl compounds containing one or more ethylene linkages both the above reactions occur simultaneously, *i. e.*, one molecule of ozone is added to each double bond and one atom of oxygen to each carbonyl group.

Harries finds that ether appears to be capable of absorbing unlimited quantities of ozone; the product is very highly explosive. These facts probably account for the mysterious ether explosions which occur in laboratories from time to time; ozone is produced during many reactions, such as occur in flames, is absorbed by ether and the explosion follows when the ether is heated.

RESEARCHES ON THE AMINO ACIDS, POLYPEPTIDES AND PROTEIDS.

EMIL FISCHER recently delivered a lecture, under the above title, before the German Chemical Society. The report of the lecture occupies more than eighty pages of the 'Berichte'¹ and contains the chief results of

his labors in the field in question during the past six years. It thus represents the cream of several dozens of papers, and although it is severely compressed, yet the author's name is sufficient guarantee that the style is fascinating and the material of the highest order of merit. In this brief note it is, obviously, impossible to do justice to the lecture, yet some of Fischer's results and conclusions are of such general importance that a brief outline of them should be given.

The hydrolytic cleavage products formed by the action of acids, bases, or enzymes on proteids are chiefly mixtures of various amino, hydroxyamino and diamino acids, belonging to the aliphatic series, although similar derivatives of the alicyclic and aromatic series are not infrequently found. Fischer's first task was, therefore, to improve the methods for the synthesis of the above classes of compounds and to investigate their individual properties, so as to work out methods for the separation and identification of each substance when present in the mixtures already mentioned.

The second step consisted in the synthesis of 'polypeptides,' which are amide anhydrides of amino acids. Thus aminoacetic acid (glycocoll, glycine), $\text{H}_2\text{NCH}_2\text{COOH}$, yields the amide anhydride $\text{H}_2\text{NCH}_2\text{CONHCH}_2\text{COOH}$, which is termed glycylglycine and is a *dipeptide*. No limit can, as yet, be assigned to the number of such compounds which may be prepared; they usually crystallize well and are, therefore, admirably adapted for purposes of investigation. The most complicated one which has been obtained up to the present time is a heptapeptide.

Synthetical polypeptides are, of course, racemic, but those which are obtained from proteids frequently exhibit optical activity. Fischer has worked out several methods for the resolution of his racemic compounds into their optical antipodes. The results are in complete accord with the current theory of the asymmetric carbon atom.

Fischer's efforts have not been confined to synthesis; he has also investigated the compounds formed by the resolution of some

¹ Ber. d. Chem. Ges., 39, 530 (1906).

twenty of the more important proteids. Here the methods of purification referred to above have done admirable service, and their application has thrown much light on the products of the reactions in question. In this part of the work the 'esterification method' has proved to be of the greatest value. The mixture of crude amino acids is treated with alcohol and dry hydrogen chloride, and the product fractionated under highly reduced pressure (0.5 mm.).

Experiments on the peptones and albumoses have been made, but the results are not very definite; there is scarcely room for doubt that the substances obtained by the ordinary processes, such as precipitation from saline solutions, are not pure, individual compounds, but are mixtures, and new methods will be required for their satisfactory treatment. The peptones are probably complex mixtures of polypeptides.

Of the structure of these compounds little can be said with certainty at present, and practically nothing of that of albumin, for the fruitful investigation of which entirely novel methods will have to be discovered.

The number of new compounds which Fischer has obtained is already very large, and the thorough application of his methods will enormously increase it and will require the work of numerous chemists for many years. Of course this only represents a fraction of the actual quantity of work necessary, because new methods of synthesis and new combinations will undoubtedly be discovered. The question, therefore, arises, will the probable benefit be worth such a large outlay of time and money? There can be no hesitation in answering this in the affirmative. Only by the painstaking, careful investigation of all possible permutations and combinations of the polypeptides and their cogeners, can a firm foundation be laid for a real knowledge of the proteids and related compounds such as enzymes, toxins, etc., the importance of which to the biologist it is difficult to overestimate. The point may be put in another way: Suppose a true proteid were to be synthesized immediately, in some such simple—

and brutal—way as the heating of an amino acid in presence of a dehydrating agent, what would be gained? The answer is, practically nothing for biology and hardly anything more for chemistry.

All interested in science will join in the hope that Professor Fischer's restoration to health may be sufficiently permanent to enable him to continue, for many years, his wonderful and valuable investigations.

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THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS AND THE METRIC SYSTEM.

THE following preamble and resolutions concerning the 'metric system' were favorably reported to the board of directors of the institute by the standardization committee at the directors' meeting of March 23, 1906:

WHEREAS, The Metric System of Weights and Measures offers very great advantages by its simplicity, consistency, and convenience in every-day use, as well as in engineering and scientific calculations and computations; and

WHEREAS, These advantages have already been demonstrated by the universal adoption and entirely successful use of the metric system in all civilized countries, except Great Britain and the United States; and

WHEREAS, All the electrical units in universal use, such as the volt, ampere, ohm, watt, etc., are metric units; and

WHEREAS, The industrial use of these electrical units would be much facilitated by the general adoption of the metric system.

Resolved, That this committee unanimously recommends the introduction of the metric system into general use in the United States at as early a date as possible without undue hardship to the industrial interests involved.

Resolved, That this committee favors such legislation by Congress as shall secure the adoption of the metric system by each department of the national government as speedily as may be consistent with the public welfare.

The board subsequently submitted the matter to the membership for a letter ballot. Of the 3,300 associates and members residing in the United States, replies were received from 1,747 up to May 5. Of these 1,569 voted in favor of the resolutions and 178 against them.